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**COMBAT HEALTH SUPPORT OF THE
TRANSFORMATION FORCE IN 2015**

BY

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ABSTRACT

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The Army is undergoing transformation to enhance its power projection capability to meet the requirements expected for 21st century combat. The role of the Army Medical Department is to conserve the fighting strength through preventive medicine, evacuation, and treatment of the sick and wounded. Minimizing death and morbidity requires appropriate and timely evacuation and treatment. Joint medical doctrine has been changed to emphasize evacuation of less-stable patients out of theater and decrease the theater hospital footprint. Review of recent military operations indicates that hospital care has played a large role and that prolonged evacuation resulted in increased mortality. However, deployed hospitals are large and slow to deploy. Army transformation will result in units that are rapidly deployable and can enter combat upon arrival in a theater of operations. Combat, especially forced entry operations, results in casualties that must be cared for. Current Army medical force structure does not support the operations considered likely with Army transformation. The Army Medical Department must transform to provide high quality combat casualty care to the Army of 2015.

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"The only certain result of your battle plan will be casualties – mainly the enemy's if it's a good plan, yours if it's not. Either way, the foremost in your supporting plans must be your medical plan."

Brigadier Rupert Smith, 1990
Deputy Commandant of the Royal Army Staff College

On 3 March 1991, after touring the 41st Combat Support Hospital near Jalibah Air Base in Iraq, an infantryman said, "Doc, if we knew there was this much (medical capability) this far forward, we wouldn't have worried so much about getting shot." I was a physician assigned to the 41st Combat Support Hospital, which was operational in the division rear area of the 24th Infantry Division rear area during Operation DESERT STORM. The hospital was farther forward than the doctrinally correct Corps area. Earlier that day the 41st surgeons had saved the life and leg of a critically wounded American soldier. Had the hospital been even thirty minutes travel time farther to the rear, the soldier would have certainly died of hemorrhagic shock.¹ These examples illustrate the primacy of the first Battlefield Rule of the U.S. Army Medical Department (AMEDD) – Be There.²

In June 1999, the Supreme Allied Commander – Europe, General Wesley Clark, called for NATO to commit ground troops to bring an end to the prolonged air campaign against Serbia. Allied aircraft, flying above 15,000 feet to avoid casualties, were unable to stop the ethnic cleansing of hundreds of thousands of Kosovar Albanians from the Serbian province of Kosovo. The U.S. was initially unwilling to enter ground combat because of the fear of casualties, but decided in June to begin their deployment to ensure they were capable of fighting before the Balkan winter. Light infantry could arrive quickly but was vulnerable to attack and had insufficient firepower to defeat Serbian armored forces. Air assault and mechanized forces would take two months to deploy and would be challenged by poor roads and insufficient sea and airports. Threat of ground attack and destruction of infrastructure in his cities made Serbian dictator Slobodan Milosevic abandon Kosovo before the Army was put to the test. In a pattern repeated several times since the atomic bomb was used in 1945, the Air Force and Navy suggested that air power alone would win wars and that the Army was irrelevant, except as peacekeepers.³

The end of the Cold War eliminated a substantial risk to national survival, and subsequent conflicts, from DESERT STORM to Kosovo, appear to make war nearly risk free. The American people expect that our wars will be fought so that the goals achieved are worth the costs, and these costs are increasingly accounted in the number of dead and wounded. In operations not directly related to our national interests, as in Somalia and Kosovo, absence of casualties is increasingly perceived as the most important goal.^{4,5}

On the day he assumed his position as Chief of Staff of the U.S. Army, General Eric Shinseki called for transformation of the Army. "Today our heavy forces are too heavy and our light forces lack the staying power we need. Heavy forces must be more strategically deployable and more agile with a smaller logistical footprint. Light forces must be more lethal, survivable, and more tactically mobile." His vision is a response to the lessons of the post-Cold War world, from the Persian Gulf War to the Kosovo intervention. It is grounded in the geopolitical and technology truths that make future conflicts likely, rapid, and challenging. We must transform to get capable forces in theater early, before the enemy has attained his objectives, gone on the defensive and holds the initiative.⁶⁻¹²

Like our combat forces, deployable medical equipment, organization and doctrine have not significantly changed since 1991. Transformation will radically alter the way we fight and the speed with which we can engage in significant combat which results in casualties, thus requiring the capability to provide combat casualty care more quickly than in the past. Forced-entry operations can result in high casualty rates before medical support in the theater is fully developed. Care for early casualties becomes a key component of the success of the operation and, as such, a center of gravity.¹³ The uncertainty of war drives redundancy and capability far beyond efficiency. Despite marked improvement in information technology, the uncertainty and friction of war that Clausewitz emphasized have not been abolished.¹⁴

This paper examines the lessons from recent conflicts and the challenges of the future to propose Combat Health Support Transformation to support the Army in 2015. It addresses several important questions. What will the next war be? Will Mogadishu or Kosovo be the paradigm? Will estimates of low casualties prove correct? Will Air Force and Joint Staff policies to enhance inter-theater evacuation at the expense of in-theater treatment be implemented? If so, will they place combat casualties at unacceptable risk? Will the Army transform Combat Health Support (CHS) so that the AMEDD can adequately support the Transformation Force? How should CHS be transformed?

WHY FOCUS ON 2015?

In May 2000 the U.S. Army Training and Doctrine Command (TRADOC) held its first Army Transformation war game (ATWG 2000) at the U.S. Army War College. The game was set in 2015 because at that time the Army will have a mix of Transformation Objective units (Objective Force), interim brigades equipped with off-the-shelf equipment (Interim Force), and heavy forces similar to those that won the Gulf War (Legacy Force), thus resulting in potential vulnerability in the ability to integrate forces. In the Transformation war game the opposing force commander deliberately planned to inflict maximum casualties on American forces as quickly as possible. His goal was not attrition but to create such public outcry that the U.S. would seek peace. He identified the core American strategy, to win with the "least cost in lives and treasure," and his strategy centered on countering American strengths in information, air and naval power.¹⁵

COMBAT HEALTH SUPPORT

A clear understanding of combat health support (CHS) is necessary to analyze the effects changing warfare will have on soldiers, and how ill or injured soldiers will be cared for. Battlefield care of U.S. soldiers is high quality medicine in austere circumstances, delivered in treatment facilities arrayed in echelons of increasing capability. Due to the physiology of wounds, prolonged evacuation and treatment delay add risks and costs to casualty care.

The CHS mission is to conserve the fighting strength. Unlike peacetime care, battlefield care is organized to provide the most benefit to the maximum number of soldiers, and to enable continued unit function despite casualties. Patients are treated as close to their unit as possible and returned to duty, or if unable to return to duty (RTD), evacuated to the rear for further treatment.¹⁶ CHS is an integral part of the Army at war and must be properly integrated on the battlefield to fulfill its mission. Combat commanders sometimes see only the great cost to combat power that is required to evacuate and treat the wounded, and resist inclusion of significant CHS in their plans. Medical planners must convince warfighters that properly planned and conducted CHS is a combat multiplier, and that rapidly clearing the combat zone of the severely sick and wounded provides commanders freedom of action and enhances fighting spirit.¹⁷

The comprehensive CHS system is organized in ten Medical Battlefield Operating Systems as summarized in Table 1. This paper will focus on Area Medical Support, Evacuation, and Hospitalization, with some discussion of Preventive Medicine and Medical Logistics.

TABLE 1. MEDICAL BATTLEFIELD OPERATING SYSTEMS

Preventive Medicine	Hospitalization
Veterinary Services	Evacuation
Dental Services	Medical Logistics
Laboratory Services	Combat Stress Control
Area Medical Support	Command and Control

Medical assets supporting war in or near the theater of operations should be the minimum necessary, in order to reduce transportation assets diverted from warfighting capability, and to minimize forces at risk from the enemy. A casualty is a combat-zone soldier who is non-effective for any medical reason.¹⁸ Medical planning depends on accurate estimates of casualties, which are normally divided into battle injury, non-battle injury, and disease. Disease and non-battle injury (DNBI) can be estimated if the climate and the prevalence of endemic diseases in the theater of operation are known, but estimation of battle casualties is difficult and not scientific. CHS functions first to prevent casualties, especially from DNBI, and then to treat battle casualties. Historically, most casualties resulted from disease or a hostile environment, but with improvements in preventive medicine, battle injuries (wounds) cause an increasing proportion.¹⁹ Casualty rates are given as incidence (i.e., the number of casualties per 1,000 soldiers per day). The incidence of DNBI applies to the entire force in theater but the battle casualty incidence applies to forces in actual combat, which may vary over time. However, in modern combat, troops well to the rear of the corps boundary may be at risk from missiles and aircraft; the largest American casualty incident in the Persian Gulf War was a SCUD missile strike on a warehouse/barracks in Saudi Arabia.

The combat casualty care system attempts to reduce both mortality and morbidity. Combat mortality is defined as either killed in action (KIA), or died of wounds (DOW). Dying before entering the medical system is defined as KIA. This means dying before reaching the battalion aid station, the lowest level physician-staffed medical treatment facility. Soldiers who expire after reaching a battalion aid station are classified as DOW. The goal of combat casualty care is to eliminate DOW and to reduce the KIA rate as much as possible. Since World War II, over 90% of U.S. combat deaths have been KIA.²⁰ The DOW rate has declined with more rapid

evacuation since helicopters were introduced during the Korean War. The DOW rate was 4.5% in World War II, 2.5% in Korea and 2% in Vietnam.²¹ During World War II, intra-abdominal injury was the most common cause of DOW. In the Vietnam War, head wounds comprised the largest DOW category.

There is a reciprocal relationship between percentage of KIA and DOW, critically influenced by evacuation times. Rapid evacuation in Vietnam brought gravely wounded casualties to the hospital who would have died on the battlefield and been classified as KIA in previous wars. With rapid evacuation the percentage of casualties KIA is reduced, but if the severely wounded eventually die, the DOW percentage increases. Prolonged evacuation results in the opposite, the great majority of the gravely wounded dying on the battlefield (KIA). Casualties surviving to reach the hospital level are generally less severely wounded and less likely to die, so the DOW percentage decreases. The effect of slow evacuation was observed by the British Army in the Falklands War, where a high percentage of casualties were killed in action (31%) and a low percentage died of wounds (1.1%).²² Typical data from recent wars indicate that about 20% to 25% of casualties are killed in action and about 3% to 5% die of wounds. Thus, 70% to 80% of wounded soldiers survive.²³

The effectiveness of combat casualty care must be measured by total mortality, not the died of wounds rate. The goal of combat casualty care must be to evacuate casualties as rapidly as possible to treatment capable of saving those who have a chance of living. However, treatment effectiveness and treatment capability are not necessarily the same. Incremental improvements in capability may not improve effectiveness (i.e., reduce morbidity or mortality), but are likely to increase the deployed medical footprint. The ideal is to have the exact capability required as close as possible to the battle.²⁴

Data from Vietnam suggest that about 65% of deaths in combat occur immediately or within five minutes of injury, and another 15% within thirty minutes. In Vietnam, up to 38 % of KIA could have been prevented by self-aid or buddy aid, usually application of a dressing or tourniquet to a bleeding extremity, or relief of obstructed breathing or an open chest wound. The implication for combat casualty care is that improved immediate battlefield treatment, especially stopping hemorrhage, will have the greatest effect in improving survival.²⁵ In the Israeli invasion of Lebanon in 1982, units that had received extra first aid training suffered significantly less mortality and morbidity from wounds.²⁶ In the experience of the Israelis, the British in the Falklands, and American Rangers in Grenada, soldiers did not stop fighting to assist wounded buddies, but gave care after the battle. This may have extended the survivable period to reach the first medic or medical officer and more expert care.²⁷ The U.S. Army developed the Combat

Lifesaver (CLS) concept in the 1980s. One fighting soldier per team, squad or crew receives training in basic trauma care skills and a small bag of equipment. The skills learned are assessment of trauma, administering intravenous fluids, and stopping bleeding. After completing combat or support tasks, the Combat Lifesaver can assist his buddies if a medic is not available or is busy with more severe casualties. Self and buddy aid are likely to become even more important as troops are increasingly dispersed on the modern battlefield.²⁸

Although rapid evacuation is very desirable, the civilian trauma transportation goal of reaching a surgeon within one hour is not applicable in combat. That "Golden Hour" concept is based on studies in which blunt (non-penetrating) trauma predominates and about 30% of deaths occur one to three hours after injury. Combat trauma has a bimodal distribution of deaths, with about 90% occurring before arrival at a medical treatment facility. Two-thirds of deaths are immediate or within five minutes, and another 15 per cent are within 30 minutes. Five to twenty percent of deaths occur between thirty minutes and six hours, with half of those deaths occurring in the first two hours. The probable explanation for this time distribution is rapid hemorrhage from penetrating injury. Prompt evacuation is important for those severely injured soldiers who would otherwise die between 30 minutes and six hours, and to prevent prolonged shock, which is usually implicated in late deaths due to multiple organ failure and sepsis.²⁹ Early treatment of shock and removal of infectious foci are essential to prevent multi-system organ failure, which requires prolonged intensive care and has a 60% mortality rate.³⁰ Unless they receive stabilizing care (Advanced Trauma Life Support, or ATLS) within the first hour, many casualties will not survive until surgery, even if they receive adequate self/buddy aid.³¹ Four factors - austerity, casualty density, danger, and goals – distinguish military ATLS from that in the civilian sector.³² Some state that the goal in CHS should be to get ATLS-stabilized casualties to surgery within four hours.³³

Combat casualties also have a tri-modal distribution of severity, with about 40-50% being minor. Approximately 25-35% are medium severity, many of which require surgical treatment for recovery. Twenty to twenty-five per cent are severely injured, and will all die without prompt treatment; many will die even with the best treatment.³⁴ This casualty distribution argues for a "Principle of Selectivity": treat the minimally injured as close as possible to the battlefield and remove the severely injured from the battle area.³⁵

Placing appropriate medical resources to meet operational demands requires determining the types of diseases and injuries expected to be seen at various echelons of care and determining the personnel and medical resources needed for each disease or injury category.³⁶

Casualties are either returned to duty or evacuated through successive echelons which have increasing capabilities, illustrated in Table 2.³⁷

TABLE 2 - ECHELONS OF CARE

ECHELON (LEVEL)	CAPABILITY
Level 0 - Combat Lifesaver (CLS)	- Buddy Aid - Stop bleeding Start intravenous fluids -CLS bag
Level I A - Combat Medic	- Basic Trauma Life Support - Stabilize airway, close open chest wounds Stop bleeding, start intravenous fluids Bandage wounds, splint fractures -Medic bag
Level I B - Battalion Aid Station	- ATLS - First physician or physician assistant Insert airway, ventilate, insert chest tube Can perform in two locations simultaneously
Level II - Medical Company	- Area Medical Support - First holding capability (72 hrs), First Pharmacy, Laboratory, X-ray (PLX), First dental
Level II + - Forward Surgical Team (FST)	- Resuscitative Surgery - 2 operating tables, 8 ICU beds, with only 8 hour holding PLX from medical company, Not stand alone - requires medical company support to function Functions for only 72 hours, then must stand down
Level III - Combat Zone Hospital	- Definitive surgery - ICU care without a time limit Clinical dietetics Laundry and bath Medical maintenance Patient administration
Level IV - COMMZ Hospital	- Definitive and restorative care and surgery - Subspecialty surgery – neuro, eye, urology, etc. Occupational and physical therapy
Level V - CONUS Medical Center	- Total care - May depend on VA and civilian hospitals for overflow

Resuscitative surgery to control bleeding and to eliminate contamination is typically performed at Forward Surgical Teams (Level II +) attached to divisional medical companies, and in Level III hospitals. Definitive surgery to repair damage sufficiently to undergo inter-theater evacuation (the final surgery required for many casualties) is performed at Level III and IV hospitals. Restorative surgery to heal wounds and restore function is performed in Level IV hospitals or at Level V in the Continental United States (CONUS). The requirement for Level IV capability in theater is currently being debated.³⁸

Many factors determine the timing and location of treatment of casualties, including treatment facility locations, air superiority, pace and type of military operations, and ease of intra- and inter-theater evacuation. Basic doctrine is that no patient be evacuated further to the rear than his medical condition requires or the military situation demands. From World War II through Vietnam, 30-40% of wounded Marines were treated at Level II, about 25% were treated at Level III, and 37% were transferred out of theater (Levels IV and V).³⁹

EVACUATION

The necessity to maintain the fighting strength and morale of an army by removing the dead and wounded from the battlefield has been recognized by good military commanders for nearly 2,000 years.⁴⁰ Medical evacuation (MEDEVAC) is medically managed movement with ongoing medical supervision of the sick, injured, or wounded. It does not imply and has rarely been associated with treatment en route. Casualty evacuation (CASEVAC) is non-medically supervised transportation initiated by line units and commanders.⁴¹

Colonel Edward Churchill, Medical Corps, a senior medical consultant in World War II, observed, "Evacuation, in theory, is but an exercise in logistics in which anticipated casualties, capacity of transport shuttles, and available beds are the primary considerations. But men are not ration boxes, and physiological considerations are overriding. In actual practice, evacuation becomes a selective transport of casualties away from the combat area, based on professional medical judgments relative to the nature of the wound and to the time, distance, and method of evacuation."⁴²

Experience since 1940 shows that about 75% of severely wounded soldiers will survive eight hours of evacuation to the first surgery, if ATLS is performed early. The problem is that 25% of them will die, usually of ongoing hemorrhage, hypoxia from lung injury, or brain swelling. Delaying the first surgery past eight hours after wounding will probably also increase morbidity and mortality in those 75% who survive that long.⁴³

Helicopters are the standard for battlefield evacuation but are very limited by weather, speed and range. Army helicopters such as UH-60L and CH-47D have cruise speeds of 120 knots and a combat radius of less than 200 miles without auxiliary fuel tanks.⁴⁴ The U.S. Marine Corps is developing the MV-22 "Osprey" tilt-rotor aircraft, with vertical take-off capability and larger payloads than helicopters. Cruising speed exceeds 250 knots and the combat radius exceeds 200 nautical miles. The four crashes to date with the developmental aircraft have raised safety concerns.⁴⁵

Inter-theater evacuation is performed in fixed wing aircraft, few of which were designed for that purpose. Cabin pressure is particularly important for casualties with a chest injury, severe anemia, or hypoxia (insufficient oxygen in the blood). Aircraft pressurize their cabin altitude to between sea level and 9000 feet (2743 meters). Although the crew can alter pressurization, there are limits to maximum cabin pressure each aircraft can achieve. After maximum cabin pressure is reached, the only way to alter actual pressure is to change flying altitude. Commercial aircraft on intercontinental flights typically pressurize to a cabin altitude of about 1800 meters (about 5900 feet), which reduces inspired oxygen pressure to about two-thirds that found at sea level.⁴⁶ To prevent further injury to casualties returning to the continental United States from Vietnam, planes flew at low altitude, which slowed their speed and increased their fuel consumption. These laws of physics have implications for inter-theater evacuation of unstable combat casualties.

MEDICAL LOGISTICS

Combat casualty care is supply and equipment intensive. To maintain American standards of care and comply with U.S. Food and Drug Administration (FDA) requirements, most medical supplies must be transported to the theater. Reducing the amount of care delivered in the theater would reduce the transportation, storage, and distribution requirements of medical supplies (Class VIII).

Alteration of methods and supplies used for treatment can have marked logistics effects, but must not violate accepted standards or principles of care. Battlefield supply of Ringer's lactate, the most common intravenous fluid used for shock, consumes large amounts of available weight and cube. The choice of crystalloid (such as Ringer's lactate) versus colloid is controversial. However, using Human Serum Albumin (HSA), a colloid, would decrease transportation requirements by up to 60%.⁴⁷

JOINT MEDICAL DOCTRINE

Current doctrine emphasizes post-casualty acute medical care with increasing attention to preventive services. Definitive care is provided in theater with an emphasis on returning patients to duty, and only stable patients are evacuated out of theater. New Joint Medical Doctrine focuses more on casualty prevention and inter-theater evacuation of less stable patients, and relies less on in-theater hospitalization of the wounded.⁴⁸

As outlined in the 1999 Force Health Protection capstone document, joint medical doctrine has three “pillars”:

- A Healthy and Fit Force
- Casualty Prevention
- Casualty Care and Management

The goal of the Healthy and Fit Force pillar is to provide CINCs with highly fit servicemembers, which will improve their effectiveness. The Casualty Prevention pillar emphasizes the continuous life-cycle process of pre-deployment, deployment and post deployment health surveillance. It also encourages individual, command, and medical system cooperation to reduce or prevent casualties.

The Casualty Care and Management Pillar speaks of three phases rather than five echelons. The Theater Hospitalization concept changes the emphasis from providing definitive care to only essential care in theater, thereby decreasing the medical footprint. While hospitalization is reduced, en route care expands to allow inter-theater evacuation of less stable patients. Because this Force Health Protection doctrine is the “broadest reformulation of military medical need in more than 50 years,” changes in infrastructure and support are critical. Training in new missions, especially en-route care, will be required. Information Management will play a key role in providing real time and predictive information essential for optimal management of the reduced medical care capability in theater. New technology must be sought to improve safety of patient evacuation: transfer of intensive care patients requiring ventilator support, even within a hospital, can result in severe hemodynamic complications associated with inadequate oxygenation.^{49,50}

Force health protection has been called the most important task of the Army Medical Department. A future adversary will definitely use anthrax against us.⁵¹ There is perception that the Department of Defense failed to accept responsibility for illnesses related to Agent Orange in Vietnam and service in the Persian Gulf War, which reduced confidence and trust in the military’s position on medical issues. This lack of trust is causing resistance to the anthrax

vaccination campaign.⁵² The AMEDD must regain the confidence of the American people to apply preventive agents effectively in the future.

LESSONS LEARNED

Lessons learned regarding deployment, warfighting, and combat health support over the last 20 years are important in preparing for future combat and CHS. The following examples illustrate important points related to strategic deployability of medical forces; support of forced entry, the evacuation-treatment link, inter-theater evacuation of unstable patients, and the effects of lack of combat trauma experience on care delivered.

AFGHANISTAN

Soviet forces in Afghanistan from 1979 to 1989 suffered 8.7% wounded and 2.3% killed in action or died of wounds. Fully two-thirds of the soldiers deployed to Afghanistan were hospitalized for disease. The presence of multiple wounds increased as the war progressed, as did the severity of wounds. The Soviet experience paralleled that of the U.S. in Vietnam, with rapid evacuation resulting in more seriously injured soldiers surviving. The second order effect of this was the requirement for more intensive care beds in theater. Despite these successes, the Russians lost a large number of severely wounded because of insufficient evacuation helicopters. During planned large offensive operations later in the war, the Soviets moved special surgical teams close to the fighting, and thereby reduced the died of wounds rate of the moderately wounded from 4.3% to 2%. They evacuated unstable patients by air to the Soviet Union, with 20 % of evacuees requiring care en route.⁵³

FALKLANDS

The 1982 war to regain the Falkland Islands, 8000 miles from Britain, is the type of war anticipated for the Transformation Force. "Short wars, and more especially short and sudden wars seem to demand naval or other rapidly deploying forces to demonstrate resolve by moving swiftly to the trouble spot without massing great amounts of other conventional forces...it was a brief, violent war fought without ideology or compelling national interests...at the edges of technology ...a land, sea, air and information war...in which the loser outnumbered the winner, and the victor was punished nearly as much as the vanquished."⁵⁴ The most spectacular technology successes were British Harrier jets and Argentine Exocet missiles. The Exocet sinking of a British destroyer stunned the British people into realizing the human costs of high-

tech war. However much of the combat, especially on the ground, was very low technology. British light infantry debarked from drop ramp landing craft, marched 60-80 miles over tough terrain, and attacked an entrenched enemy.⁵⁵

Weather and terrain in the Falklands impeded evacuation and treatment of the wounded. Ground evacuation was a problem due to the limited vehicles and soft ground. Helicopters were used only at night because the British did not have air superiority. These constraints slowed evacuation from the desired six hours to more than eight hours at times. Forward surgical teams (FSTs), initially collocated in a building of opportunity, performed 241 operations and had three post-operative deaths. The surgeons attributed these deaths and some preoperative deaths to the excessive evacuation times to the FSTs. The FSTs came under air attack, which further hampered care. After the British moved forward, the collocated FSTs split into two, each with one operating table. Bad weather limited use to only one of these FSTs, which was overwhelmed with casualties because helicopters could not evacuate to the hospital ship. The British surgeons realized that the "Golden Hour" goal for surgical care within an hour of injury (ATLS Doctrine) was impractical in war but observed that long evacuation times were clearly detrimental.⁵⁶

PANAMA

The lessons of Operation JUST CAUSE are often overlooked due to the attention paid to DESERT STORM. Troops stationed in Panama before the war joined airborne attacks on objectives spread across the Canal Zone. Unexpected casualties resulted when USAF gunships wounded 21 of 26 members of a mechanized infantry platoon that was attacking an airfield.⁵⁷ Unexpected heat casualties resulted from insufficient water for soldiers who loaded airplanes at Fort Bragg in sleet and cold, requiring long underwear, and then jumped into 85 degree temperatures and high humidity in Panama. Six of these soldiers had severe heat injury and were evacuated out of the theater.⁵⁸

During Operation JUST CAUSE, 23 American service members were killed and 324 wounded.⁵⁹ Two Forward Surgical Teams were deployed to the Airfield and provided in-theater surgical capability, but had very limited holding capability. The evacuation policy was set at zero days, so 258 (80%) of the wounded were evacuated to San Antonio, Texas, a six-hour flight. Two soldiers died en route although surgeons assessed that the decisions to evacuate them were not in error. In San Antonio, service members were treated at either Brooke Army Medical Center or Wilford Hall Air Force Medical Center, both Level V facilities functioning as Level III hospitals. Some evacuated soldiers, especially those with minor injuries, were

distressed at being taken out of the theater. Medical care at both medical centers was assessed as "superb."⁶⁰

DESERT SHIELD / DESERT STORM

In Operation DESERT SHIELD, a brigade of 2300 troops from the 82nd Airborne Division was flown 7000 miles to Saudi Arabia as a demonstration to the Saudis that America was committed. These first troops, arriving 48 hours after the Saudis agreed to accept U.S. help, were at enormous risk. It was clear to Secretary of State James Baker that if Saddam attacked Saudi Arabia, "these young men could be slaughtered."⁶¹ General Shinseki noted, "It's not a battle we would have designed. Heavy mechanized forces against light infantry, and frankly, we held our breath."⁶² The threat of Iraq continuing into Saudi Arabia was real: the 100,000 troops that Iraq massed on Kuwait's border were far more than needed to conquer that small nation and its Army of 20,000.⁶³

U.S. Central Command (CENTCOM) had a secret plan to move forces to the Persian Gulf region for a contingency such as the invasion of Kuwait. The first ground forces, the airborne brigade referred to above, would arrive on C+6. The first heavy tanks would not arrive until C+26.⁶⁴ It would take about five weeks to build up a force that could defend itself, causing General Schwarzkopf to fear that the Iraqis would realize the vulnerability and attack. The time required in amassing combat power allowed the Iraqis to increase the number of troops in Kuwait from 100,000 to 430,000 by October 1990, and to improve their defenses. By December it was clear that U.S. ground forces would not be prepared for an attack until mid-February 1991.⁶⁵

Due to concerns about the potential for mass casualties from chemical weapons, two hospital ships and sixty-three hospitals (totaling eighteen thousand beds) were deployed into the theater.⁶⁶ The CENTCOM casualty estimate was 20,000 wounded and 7000 killed; others estimated casualties as high as 40,000.⁶⁷ Actual casualties were 148 Americans killed and 458 wounded.⁶⁸ U.S. medical elements provided medical care for thousands of Iraqi soldiers and numerous Iraqi civilians.

Deployment of hospital units to Saudi Arabia was slow, and care capability after arrival was even further delayed. The Army's 13,580 beds, established either in Saudi Arabia or uploaded on trucks to move closer to the fighting in Iraq, were not ready until 13 February.⁶⁹ Medical vehicles could not keep up with Abrams tanks and Bradley fighting vehicles. Doctrinal evacuation from forward to rear aid station, then to the Forward Support Battalion's Medical Company, the Main Support Battalion's Medical Company, the MASH and then the CSH, was

inefficient and not done. Medical equipment was generally outdated and supply quantities were insufficient.⁷⁰ The hospitals had poor communications capability and no awareness of the tactical situation or inbound casualties. Despite this the VII Corps Commander, LTG Franks, observed, "Our wounded soldiers were getting world-class medical care."⁷¹

During Operation DESERT STORM the Army had 18,290 hospital admissions in theater. Of these, 10,602 were returned to duty and 7,664 evacuated out of the theater, primarily to Germany. Of the patients evacuated to Germany, 4,819 were further evacuated to the United States. There were 35 in-hospital deaths.⁷² The Army Medical Department learned numerous lessons from Operations DESERT SHIELD and DESERT STORM. Although the war was short and casualties light, the AMEDD was challenged by vast distances, the rapid speed of attack, and large numbers of enemy prisoners of war (EPW) and refugees. Forward Surgical Teams, Combat Stress Control teams, and combat lifesavers were beneficial. The 60-bed MASH was too large and too slow to fulfill its intended role in the division rear area, and a smaller, more mobile hospital was advocated. Communications were not sufficient, especially for evacuation. A General Accounting Office report concluded that the Army would not have been able to provide adequate care if the ground war had started sooner, lasted longer, or if casualty numbers had matched casualty estimates. The AMEDD disputed those findings.⁷³

By 1997, approximately 90,000 of the 700,000 Americans who served in the Persian Gulf War reported health problems of variable nature and unclear cause.⁷⁴

SOMALIA

Somalia began as a humanitarian assistance mission but changed to nation building, then actual combat. Conventional wisdom holds that absence of armored vehicles resulted in avoidable combat deaths.⁷⁵ The Ranger raid in Mogadishu on 3-4 October 1993 clearly showed the danger of fighting in urban terrain, even against unsophisticated warriors. The U.S. force suffered over 80% casualties, with eighteen killed. The trapped soldiers were very frustrated that wounded comrades bled to death because helicopters could not extract the wounded. The commanders at the operations center were equally frustrated and attempted to find ad hoc ways to extract the casualties.

Elements of a Combat Support Hospital (CSH) were in Mogadishu to support initially deploying forces. When Task Force Ranger began their dangerous mission to capture a Somali warlord a surgical augmentation package joined the CSH. The additional surgeon and nurse were critical because on the day before the Ranger raid, a surgeon, anesthetist, and intensive care nurse flew with a critically injured patient to Germany. That reduced the number of general

surgeons in Somalia from four to three. This event helped convince the Air Force to develop Critical Care Augmentation Teams (CCATs) to accompany critically injured patients during air evacuation, allowing Army staff to remain in theater. The CSH operated on wounded soldiers for nearly 48 hours straight. The physicians noted that fresh whole blood drawn from soldiers kept the wounded stable longer and better than the standard packed red blood cells.⁷⁶

HAITI

The invasion of Haiti was to begin with an airborne drop, but concurrent planning for a permissive entry proved fortuitous. USNS *Comfort* was the Level III Hospital for the initial entry of 10th Mountain Division soldiers in September 1994. A Forward Surgical Team (FST), provided by the Army's 5th Mobile Army Surgical Hospital (MASH) was quickly established at the Port au Prince airport, but the heat made surgery in the non-airconditioned tents unacceptably unsanitary. An element of the 28th Combat Support Hospital arrived several weeks later and enabled *Comfort* and the FST to redeploy. The CSH received a mass casualty event prior to its official opening, but handled it well due to superb planning and rehearsals at a pre-deployment field training exercise. Telemedicine was of no clinical benefit, with the exception of a single x-ray and dermatology.⁷⁷

BOSNIA

Units entering Bosnia in December 1995 and January 1996 after the Dayton Peace Accords were combat capable heavy forces supported by a corps level medical task force. Although not opposed by fire, U.S. forces encountered floods that delayed the Sava River crossing, heavy snow, mines, rat-infested tents, and threats of terrorism. Eleven days into the operation a military policeman became the "first casualty of peace," his foot badly mangled by an antitank mine. The wounded soldier was air evacuated to the MASH supporting the bridging and entry operation.⁷⁸ The orthopedic surgeon who operated on him had no combat trauma experience and was unsure whether to amputate or attempt to salvage the foot. He chose the latter, which necessitated multiple follow-on surgeries.⁷⁹

Combat injuries were too infrequent to improve the experience of deployed surgeons. Telemedicine was useful only to transmit x-rays to be read by a radiologist, as there was no radiologist in theater.⁸⁰ Preventive medicine support was robust and innovative, enhanced by a new organization, the 520th Theater Army Medical Laboratory (TAML). Environmental and sanitary conditions were poor and the threat of Hemorrhagic Fever with Renal Syndrome was significant. The TAML conducted extensive environmental air, soil and water sampling,

expanded disease identification, and assisted with epidemiology reporting. In addition, they assisted with a voluntary in-theater vaccination program, with non- FDA approved vaccine for tick-born encephalitis. As a result of these efforts, Operation JOINT ENDEAVOR (Bosnia) was the healthiest deployment of U.S. personnel in history.⁸¹

CHECHNYA

In the Chechen War the Russians struggled with the restricted three-dimensional urban terrain. The Russians deployed four field hospitals to support their forces in the attack on Chechnya. Although the Russian people are perceived to be less susceptible to casualties than Americans, the Chechens attempted to inflict casualties to turn public opinion against the war. The Russians often had to delay medical evacuation until nightfall, and rely on ground evacuation. Medical units were deliberately targeted. The rebels shot down medical evacuation helicopters.⁸² They took advantage of fog to attack and destroy one of the Russian field hospitals.⁸³ The Russians augmented their units with medical personnel, putting a physician assistant in each company. For medical force protection the Russians recommended digging hospitals in underground. Snipers, mines and mortars changed the usual pattern of wounds, with head and neck injuries twelve times as common as abdominal injuries. There was also an increased proportion of burns. Contrary to almost every other war, the dead outnumbered the wounded.⁸⁴

KOSOVO

The National Command Authorities (NCA) announcement ruling out the use of ground forces in Kosovo apparently reflected the view that the objectives were not of sufficient national importance to warrant risking American lives. Limited Army forces deployed to Albania where they struggled with the terrain and absence of support infrastructure.⁸⁵ A tailored Deployable Medical Systems (DEPMEDS) Level III hospital was flown in on the equivalent of one C-17 aircraft.⁸⁶

In June, after the air campaign had dragged on for months and the supply of precision munitions ran short, President Clinton was pressed to begin deploying heavy forces before July to be able to fight before winter.⁸⁷ Milosevic backed down before the ground campaign was ordered, and U.S. peacekeepers entered Kosovo. Hospital capability sufficient for peacekeeping was established rapidly, and was quickly inundated with civilian casualties of continued fighting.⁸⁸ The civilian combat casualties provided excellent experience for deployed

medical personnel, but the surgeons involved all left the Army shortly after the end of the deployment.⁸⁹

YEMEN 2000

The bombing of USS *Cole* in Aden Harbor in October 2000 was an example of asymmetric warfare where the goal was clearly to create American casualties.⁹⁰ Destroyers do not have a surgical capability, so the critically wounded were treated in hospitals in Aden, despite uncertain security and austerity of care.⁹¹ French medical teams flew the eleven most severely injured sailors to their facility in Djibouti, where they operated on the two sailors who required immediate surgery. U.S. Air Force Critical Care Augmentation Teams (CCATs) flew in to safely transport the sailors to Germany, where all 39 wounded sailors were evacuated.⁹² The majority of the sailors flew on to the U.S. Two sailors who were not sufficiently stable remained in the hospital in Germany.

This historical review indicates that conflict is common and variable. Looking to the future, military planners must discern likely trends and ensure that forces are capable of maintaining the nation's vital interests. Analyzing possible future conflict sets the stage for planning for future combat casualty care. Potential options for future combat health support must consider the lessons learned from the past.

REVOLUTION IN MILITARY AFFAIRS

The principal theme of Joint Vision 2010 and 2020 is to leverage technology to maintain the forces required for victory in whatever conflict the nation engages in. The tenets of Joint Vision 2010 are Dominant Maneuver, Precision Engagement, Full Dimension Protection, Focused Logistics, founded on Information Superiority.^{93,94} Joint Vision 2020 expands information dominance to full spectrum dominance. General Shinseki's Transformation vision is consistent with the tenets of Joint Vision 2010 and 2020.

The push for minimizing the logistics footprint is economy of effort, which should be followed but not confused with efficiency. "The consequences of miscalculating the razor's edge of resource allocation are significantly higher when national interests and objectives are involved; thus a degree of inefficiency may be necessary to ensure the effective execution of strategy."⁹⁵

FUTURE COMBAT

More than 40 years ago Vice Admiral Turner Joy said, "We cannot expect the enemy to oblige by planning his wars to suit our weapons; we must plan our weapons to fight war where, when, and how the enemy chooses."⁹⁶ The future of warfare is controversial. The future international environment will include instability in Southwest Asia, Africa, and Indonesia. China may become a peer competitor analogous to the Soviet Union during the Cold War.⁹⁷

In the Information Age, military units may have to execute more rapidly, and accomplish more difficult tasks, spread over greater distances, with fewer resources.⁹⁸ The U.S. appears to be entering the Information Age, but still has an Industrial Age Army. Futurists Alvin and Heidi Toffler, as well as military historian J.F.C. Fuller, assert that societies fight the same way they create wealth, so we will fight Information Age wars. Samuel Huntington feels that wars will be clashes of civilizations, thus we will fight people with different fundamental approaches to life and warfare. Futurist Robert Kaplan predicts widespread anarchy, racial, ethnic and cultural conflicts, manifest by intra-state, low-intensity wars of survival.⁹⁹ The tremendous killing power of tomorrow's weapons will probably result in massive casualties.¹⁰⁰ In the 21st century, wars of the Falklands type are likely, fought for pride or under media pressure, despite absence of vital national interests.¹⁰¹

Some futurists believe that a peer competitor or other states will be the easiest problems we face. Our military, including forces developed by Army Transformation, are designed to defeat the armies of enemy states on a physical battlefield, but may not succeed against non-state opponents.¹⁰²

Americans historically have underestimated adversaries from developing countries. Vietnam and Somalia are two of the most recent examples of "low tech" enemies who were successful in negating advanced technology used by well-trained militaries of high-tech nations.¹⁰³ Saddam Hussein built a large, powerful conventional army, fought conventionally, and was easily defeated. The Somalis, with a rag-tag gang of untrained bandits, executed an urban ambush, which resulted in the U.S. and its allies abandoning attempts to intervene in Somalia.¹⁰⁴ Non-western militaries have trended away from building armies similar to ours. They appear to be focusing on cheap, plentiful weapons. Their tactics, practiced by the Chinese in Korea, the Vietnamese, the Afghans against the Russians, and the Kosovars, are to disperse under air or other firepower attacks, and concentrate afterwards quickly to produce casualties on vulnerable targets. Our potential opponents have learned that Western democracies get discouraged in long, bloody conflicts.¹⁰⁵

To paraphrase Clausewitz, we must constantly ask what our technology will drive our adversaries to do. Correct answers to that question will assure victory in 21st century land warfare. Despite rosy predictions of easy bloodless victory, delivered by perfect technology, war will remain a brutal, violent contest. We will face adversaries who will not play by our rules and who see our values as vulnerabilities.^{106,107} Since the end of the Cold War there has been the “reemergence of warrior societies” who reject the West. These societies glorify fighting and killing in war. A warrior in such societies, raised from childhood to fight, “prefers death to dishonor and kills without pity when he gets the chance.”¹⁰⁸

CONCEPTS OF FUTURE BATTLEFIELD CARE

As a result of the medical services’ difficulties in deploying, establishing, and sustaining medical units during Operation DESERT STORM, the Department of Defense developed a Medical Readiness Strategic Plan. The plan directed medical services to field lighter and more deployable forces, to improve joint medical planning, including medical logistics planning, medical evacuation, information management, and medical readiness oversight. These improvements remain to be completed.¹⁰⁹

The Army Science Board believes that the operational commander will benefit from improvement in the medical system. Such improvements should result in more efficient triage and medical systems, with decreased patient treatment time, which will result in decreased requirements for medical personnel, facilities, and deployed support. Technology improvements include more rapid patient assessment, faster information flow between medical units, and on-site production of intravenous fluids, oxygen, and vaccines.¹¹⁰ Drugs and vaccines will be important to prevent and/or treat conditions to which deployed soldiers will be exposed. If these potential health threats are not common to civilian life, the treatments cannot be adequately tested to obtain Food and Drug Administration (FDA) approval. During Operation DESERT STORM, pyridostigmine bromide and anthrax vaccine were used as “investigational agents” because they had not been approved by the FDA for use for the conditions expected in wartime. While legal, such use is cumbersome, requires an FDA agreement, may require informed consent, and creates the perception that the Department of Defense is using service members as “guinea pigs.”¹¹¹

Technology solutions to CHS challenges are being intensively researched, starting with the soldier. A significant problem in infantry combat is determining when a soldier is wounded and where he is. The Land Warrior system has a “911” button to indicate a need for help which,

along with the distressed soldier's location, would be transmitted to the squad leader and platoon medic. The Army is currently testing the Warfighter Physiologic Status Monitor (WPSM), which will transmit heart rate, respiratory rate, temperature, and "an index of alertness." WPSM will eventually give predictive data of physiologic distress, such as heat or cold injury and exhaustion, enabling commanders to have objective data to help decide which units are most capable of accomplishing missions. Additionally, WPSM will detect wounding and automatically send a distress call to the medic.¹¹²

On future battlefields forces are expected to be widely dispersed and distributed discontinuously, rather than linearly. The combat medic will be required to give care longer and will require enhanced ability to insert and maintain airways, support ventilation, and stop bleeding.¹¹³ Recognizing this, training for Army combat medics has expanded from ten to sixteen weeks, followed by practical sustainment training.¹¹⁴ Products expected to be available by 2015 include hemostatic bandages, oxygen-carrying intravenous fluids, and easily used airway devices. Canned fibrin, a blood coagulant, will be used like cans of flat tire sealers, the nozzle inserted into a wound in the casualty's abdomen and fibrin sprayed in to stop bleeding.¹¹⁵

Evacuation of the wounded from the battlefield over extended distances will require treatment en route. Improved litters with built-in monitoring and treatment capability have been developed but are too heavy for battlefield use. The MEDEVAC helicopter has been upgraded to enhance monitoring and en route treatment.¹¹⁶

The dispersed and fluid battlefield of the future will require lightweight, small, very mobile medical facilities with extensive digital information capability. These forward medical treatment units should be as close to combat action as the tactical situation allows. Locating them within a few kilometers of the battle would allow prompt surgical resuscitation to stabilize the patient for evacuation. An ophthalmologist may be needed in forward surgical hospitals to treat eye injuries from lasers and other directed energy weapons.¹¹⁷ Minor robotic surgery has been performed using telephone lines to transmit the surgeon's moves. Improvements could lead to battlefield use, reducing the need to deploy a surgeon, but would require public and soldier confidence, and massive increases in information transmission.¹¹⁸ An electronic "dog tag" has been developed to store data about health status or care delivered and can accompany the casualty to subsequent sites of care. Telemedicine has not fulfilled its promise but may be further developed into a tool useful for information transfer between non-physician providers and physicians. The U.S. Air Force has changed doctrine, both in willingness to send C-130 aircraft to evacuate patients from forward hospitals, and to evacuate less stable patients.¹¹⁹

The Army Science Board believes that technology integration into the AMEDD's functions is critical, but warns against eliminating support that technology can't replicate.¹²⁰ This would include being wary of unproved massive inter-theater evacuation of less stable patients.

The AMEDD After Next Joint Medical Wargame 2000 resulted in numerous important observations about combat casualty care in future operations. Different casualty patterns are expected and will require new approaches to combat casualty care. Providing care to early casualties will be critical to mission success at the time when the medical footprint is extremely limited. New concepts and capabilities are essential if military medicine is to meet this requirement.¹²¹ Provision of the capabilities required for ideal evacuation and treatment could impose a burden that might well endanger the success of the combat mission.¹²² Affordable solutions must be found that the warfighting commander can accept and support.

Movement to and on the battlefield will be rapid, and engagements are likely to be brief and lethal. Providing CHS in such operations will be an enormous challenge. Flexible, modular highly capable medical units with the smallest possible footprint will be required to deploy, often on short notice. With direct CONUS to theater deployment and the possibility of forced-entry operations, casualties in high numbers may occur before establishment of significant hospital capability in theater. Stabilization of casualties far forward, followed by rapid evacuation, has the potential to reduce the total medical footprint in theater and minimize the logistics burden on mission accomplishment. However, there are risks inherent in trading evacuation for hospitalization in theater; these must be successfully mitigated. Long-range weapons will probably increase the size of the enemy's exclusion zone, greatly extending evacuation distances or requiring placement of treatment facilities in areas vulnerable to enemy attack. Evacuation platforms, both ground and air, will be subjected to attack. Significant technology improvements will be required to enable casualty survival over extended evacuation distances. One possible long-term goal would be to put the casualty in "suspended animation" until reaching a treatment facility, but this could require a larger capability than the treatment facility itself.¹²³

Accurate casualty estimates are required to determine what capability is needed. Current tools are inadequate for incorporating the effects of forced-entry, dispersion, vulnerability of rear areas such as ports of debarkation and logistics bases, and weapons of mass destruction (WMD) on casualty estimates. WMD effects could include an electro-magnetic pulse, which could destroy sophisticated medical equipment. Transition from combat to Support and Stability Operations (SASO), and back, may be required and will create challenges in capability, flexibility and rules of engagement.¹²⁴

These challenges brought the exercise participants to two fundamental conclusions. First, a Joint Medical Command structure is needed for effective planning and execution of future medical support. Second, total situational knowledge is a fundamental requirement for support. To ensure the right amount of capability at the right time in the right place, widely dispersed and deployed over great distances, requires total visibility, from the individual soldier to the CONUS sustainment base. Only with precise knowledge can a non-redundant system be sufficiently safe; even with precise knowledge, there will be a large element of risk. All these future concepts and capabilities require great technology improvements, summarized in Table 3.¹²⁵

TABLE 3 – DESIRED TECHNOLOGY ENABLERS

MEDICAL TECHNOLOGY	NON-MEDICAL TECHNOLOGY
Advanced resuscitation and stabilization capability	Information management/ Information technology Infrastructure
Single dose multivalent vaccines	Automatic voice-activated digital interface and translator capability
Advanced hemostatic control	Strategies to mitigate operational stress
Single dose multipurpose antibiotics	Non line-of-sight communications for medical units
Pharmacological protection against biological and chemical agents	Vertical take-off and landing air platform technologies for evacuation
Effective, lightweight oxygen generation capability	Automated logistics to include unmanned pinpoint delivery
Non sensory-depriving pain medicines	Lightweight composite materials
Artificial blood / oxygen carrying fluids	Compact power sources
Common diagnostics for diseases, chem/bio threat	Advanced sensors (complex terrain penetration) and electronics
Individual physiological monitor/locator	
Genomic therapeutics	
Protection from environmental threats	
Miniaturized medical equipment	
Remote piloted evacuation vehicle for urban terrain	
Telemedicine (real-time)	

DISCUSSION

The campaigns reviewed illustrate the varied commitments likely for U.S. forces. There is clear potential for SASO missions to shift quickly and unexpectedly to combat, as happened in Somalia. Geostrategic and demographic trends indicate that urban combat in the developing world will be necessary, and the lessons of Mogadishu and Chechnya show that it will be difficult and bloody. Asymmetric threats and weapons of mass destruction will remain constant dangers. Determining where, when, and how to intervene in future conflicts will be difficult and risky. Complicating these conflicts and decisions will be the expected rise of a near-peer competitor, most likely China.

The fundamental assumption behind the Army Transformation is the perceived future requirement to project land forces rapidly to areas of conflict, either to deter opponents, or to apply military force before the opponent achieves and consolidates his objectives, making our military response too expensive. Without pre-positioned equipment, the lift required for a brigade to enter combat in 96 hours and a division in 120 hours is huge, leaving little for medical forces. Information dominance is required for the Transformation Force to succeed against a competent and determined enemy. Legacy systems scattered around the world will be capable of destroying the Interim Force vehicles if they can find them, and possibly will have the same ability against the Objective Force Future Combat System. Sensors and intelligence collection platforms must work well and communications links must remain functional, for our "network-centric" force to succeed. Our potential enemies clearly understand this and will mount asymmetric attacks against key information links to degrade or destroy the network. Enemy success in degrading the network may place thinly armored and lightly armed vehicles at the mercy of far less technologically sophisticated industrial-age weapon platforms. The probable second order effect will be casualties, which in our culture, must be provided the best possible care. CHS units today have problems similar to those of current combat forces. Forward surgical teams are too light and are not capable of sustained casualty care. Combat Support Hospitals are too heavy and are not reasonably transportable by air. A Combat Health Support Transformation must create a medical force that is responsive, deployable, agile, versatile, lifesaving, survivable, and sustainable.

The usual planning variables of mission, enemy, troops, terrain, time available and civilians (METTT-C) will continue to apply to operational planning. However, command decisions cannot alter the physiological deterioration in the casualty initiated by wounding or the

process of healing. Military planning must provide appropriate care or risk an increase in morbidity and mortality, along with reduced returns to duty.¹²⁶

The most challenging scenario is a direct CONUS-to-theater deployment, without an intermediate staging base, with forced entry and combat upon arrival. Clearly, this scenario could require evacuation of casualties directly from the battlefield to a hospital-level treatment capability away from the theater, as occurred in Operation JUST CAUSE. The joint doctrine outlined in Force Health Protection calls for reduction of in-theater hospitalization and increased inter-theater evacuation of less stable patients.¹²⁷ This radical change in doctrine may risk the lives of our wounded. Reducing hospitalization in theater is particularly risky in the absence of accurate casualty estimates and absolutely dependable, timely evacuation. Recent experience in SASO suggests that evacuation has numerous limitations and that intercontinental evacuation of unstable casualties may result in increased morbidity. Few providers, from combat medic to trauma surgeon, have any real combat experience, and short sharp wars will not likely provide any significant body of experience. Medical plans need sufficient redundancy to be successfully executed by inexperienced practitioners and units. Air Force airfield medical support and Navy medical facilities afloat may be the best solution for providing hospitalization to ground troops.

COMBAT HEALTH SUPPORT PROPOSAL

On the 21st century battlefield , the desire to deploy unnecessary capability must be ruthlessly denied. Preventive medicine and health and environmental surveillance will be essential on future battlefields, especially where there is a risk of chemical or biological warfare.

At some time in the future, wounded could be placed in suspended animation or hospitals may be contained in a vertical take-off aircraft, but until then, the system developed by Jonathan Letterman in the American Civil War will remain relevant. Wounded soldiers will have to be found on the battlefield, given initial treatment, and evacuated through a chain of increasingly sophisticated treatment facilities. With extended distances on future battlefields and the likelihood that hospital capability will be out of theater, helicopters will no longer be acceptable evacuation platforms.

The U.S. Army needs a deployable, capable MASH and an improved aero-medical evacuation platform. Treatment en route will require providers more capable than combat medics, such as nurse practitioners or physician assistants. Litters with built-in critical care equipment, similar to but lighter than those currently under development, will markedly enhance

the ability to deliver true critical care to casualties during evacuation. The providers will transfer patients in their self-contained litters to a hospital that may be afloat, out of the combat zone in an intermediate staging or sanctuary base, or in the combat zone. Any hospital that can be quickly deployed by air must be lightweight and small. The industrial-age Deployable Medical Systems, though tailororable, will not support the Transformation Force in rapid force projection. Lightweight shelters and medical equipment are available and need to be made survivable without becoming too heavy. Modular organizations can deploy the right capability and expand capacity as needed.

Quality care requires quality people, with appropriate training. Improved trauma training will be needed for everyone from the combat medic to the Level V hospital. Partnerships with civilian trauma centers will remain important because military facilities do not see enough trauma patients to train sufficient numbers of providers. Simulations must be developed for realistic hands-on training at all levels. With short-notice, come-as-you-are missions, medical units will need to be well trained and have equipment that is well maintained and ready to load on aircraft. A key, but often neglected training requirement is to ensure that warfighters understand what the medics can (and cannot) do and how to employ them.

Combat medical care is not simply an expensive humanitarian effort against the inhuman effects of war. Employed correctly, it is a combat-multiplier.¹²⁸

WORD COUNT = 9,567

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⁷⁶ Philip Volpe, "Presentation by Task Force Ranger Surgeon," AMEDD Pre-Command Course, San Antonio, Texas, March 1998.

⁷⁷ Virgil T. Deal, Corps Level Medical Support in Haiti - September 1994 through January 1995, Personal Experience Monograph (Carlisle Barracks, PA: U.S. Army War College, 22 May 1997), 6-16.

⁷⁸ Tala Skari, "A Dangerous Peace," Life (February 1996): 37.

⁷⁹ The author was the MASH commander and was present for the initial resuscitation and treatment, and received updates of progress from the patient's eventual destination, Walter Reed Army Medical Center.

⁸⁰ The author was the MASH and later, Medical Task Force, Commander.

⁸¹ Kenneth J. Tannen, John J. Ciesla and Mustapha Debboun, "Military Preventive Medicine Support: The Balkan Experience," Military Medicine 164 (December 1999): 855.

⁸² George H. Franco, "Other Shortcomings in Chechnya," Army 49 (September 1999): 4-5.

⁸³ Michael R. Gordon, "Chechen Saboteurs Torch Russian Field Hospital," The New York Times, 7 January 2000, p. 9-10.

⁸⁴ Grau and Jorgensen, 4-9.

⁸⁵ "Interview: General Eric K. Shinseki," 24 October 2000; available from <http://www.pbs.org/wgbh/pages/frontline/shows/future/interviews/shinseki.html>; Internet; accessed 10 November 2000.

⁸⁶ Alan L. Moloff and Suzan Denny, "The Contingency Medical Force: Chronic Challenge, New Solution," Military Medicine 166 (March 2001): 199-203.

⁸⁷ Elliott Abrams, "Just War. Just Means?" National Review (28 June 1999): 16.

⁸⁸ Chris DeHart, "Welcome to 'Kosovo Hope,'" Soldiers 54 (November 1999): 32.

⁸⁹ C. William Fox, Commander, 30th Medical Brigade, Conversation, March 2000.

⁹⁰ Daniel Pipes, "Declaration of War," National Review 52 (4 December 2000), 6.

⁹¹ Jessie Halladay and Dave Moniz, "Personal Stories Surface After USS Cole Blast," USA Today, 4 December 2000, p. 19.

⁹² The ideas in this paragraph are based on remarks made by a speaker participating in the Commandant's Lecture Series.

⁹³ Concept for Future Joint Operations: Expanding Joint Vision 2010 (Washington, DC: Government Printing Office, May 1997), 2-3.

⁹⁴ Douglas A. Macgregor, Breaking the Phalanx: A New Design for Landpower in the 21st Century (Westport CT: Praeger, 1997), 50-52.

⁹⁵ William T. Johnsen, *et al*, The Principles of War in the 21st Century: Strategic Considerations (Carlisle, PA: U.S. Army War College, 1995), 15.

⁹⁶ Robert Heinl, ed., Dictionary of Naval and Military Quotations (Annapolis: U.S. Naval Institute, 1984), 358; quoted in Charles J. Dunlap, Jr., "21st-Century Land Warfare: Four Dangerous Myths," Parameters (Autumn 1997): 36.

⁹⁷ Bill Gertz, "General Shelton sees China as Growing Threat to U.S.," The Washington Times, 15 December 2000, p. 1.

⁹⁸ Johnsen *et al*, 13.

⁹⁹ David W. Shin, "Future War: Back to Basics," Military Review 79 (September-October 1999): 63-68.

¹⁰⁰ Steven J. Eden, "Remembering the Human Factor in War," Military Review 79 (May-June 1999): 36.

¹⁰¹ Allard, iii.

¹⁰² Robert J. Bunker, "Higher – Dimensional Warfighting," Military Review 79 (September-October 1999): 57.

¹⁰³ Charles J. Dunlap, Jr., "21st-Century Land Warfare: Four Dangerous Myths," Parameters (Autumn 1997): 27.

¹⁰⁴ Sydney J. Freedberg, Jr., "Beyond the Cole," National Journal (21 October 2000), 1.

¹⁰⁵ Robert H. Scales, Jr., "Adaptive Enemies: Achieving Victory by Avoiding Defeat," Joint Force Quarterly (Autumn/Winter 1999-2000): 8-13.

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¹⁰⁹ General Accounting Office, Wartime Medical Care (Washington, D.C.: U.S. Government Printing Office, 1996), 1-7.

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¹¹² Board on Army Science and Technology, Commission on Engineering and Technical Systems, National Research Council, 30.

¹¹³ Center for Healthcare Education and Studies, 21.

¹¹⁴ Robert A. De Lorenzo, "Improving Combat Casualty Care: Focus on the Military Medic," Army Medical Department Journal (January-February 1998): 24-29.

¹¹⁵ Board on Army Science and Technology, Commission on Engineering and Technical Systems, National Research Council, 31.

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¹¹⁷ Ibid., 33-36.

¹¹⁸ Jim Ritter, "With a Mouse, Doctor Here Operates in Baltimore," Chicago Sun-Times, 25 October 2000, p. 17.

¹¹⁹ Ronald R. Blanck, "AMEDD Responds to Change," U.S. Medicine, January 1998, 15-16.

¹²⁰ John H. Carter, Jr., The Tooth To Tail Ratio: Considerations for Future Army Force Structure. Strategy Research Project (Carlisle Barracks: U.S. Army War College, 7 April 1997), 21.

¹²¹ Center for Healthcare Education and Studies, 36.

¹²² Wolcott, 27.

¹²³ Center for Healthcare Education and Studies, 21-31.

¹²⁴ Ibid., 17-22.

¹²⁵ Ibid.

¹²⁶ Wolcott, 27.

¹²⁷ Medical Readiness Division, J-4, The Joint Staff, 5-8.

¹²⁸ Wolcott, 38.

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